

## Defence against Aeroplanes Using Theory of Rip Currents

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### Abstract

If a rip current makes swimming through it strenuous, does it follow; specific frequent electromagnetic waves might make a medium impermeable for aircraft to pass through it? This paper aims to discuss and answer this question. In defence industry, millions of dollars are spent yearly to patrol skies by plane and maintain a large sky spanning several thousand kilometres safe. If there was a onetime defence mechanism in any country in place which makes the outer sky of that country impermeable to external air threat; sky observance due to external threat anxiety would decrease in a country and countries would have to spend very less amount of money overall in a decade to maintain its skies. Here electromagnetic waves of increased amplitude and several other properties as discussed in main paper are used to create high stagnation pressure at all points the wave passes through such that aerial vehicles passing through such point can't easily pass through and provided enough stagnation pressure exerted against it; would break into pieces.

**Keywords:** Wave; Particle; Rip current; Coast; Coastal; Aerospace

### Introduction and Theory

Considering two distant waves; each with mass density  $\rho$  are flowing with same velocity  $v$ . One of the waves is a rip current with width  $l_1$  with acceleration  $a$  and other normal narrower ocean wave with width  $l_2$  with same acceleration  $a$ ; each with same altitude,  $h$ , from sea ground. For same altitude of wave,  $h_1=h_2$ ;

$$\text{If } l_1 > l_2$$

$$\text{Then } l_1 \times h > l_2 \times h$$

$A_1 > A_2$  (where  $A_1$  is surface area of wider continuous wave and  $A_2$  being surface area of narrower wave)

$$v \times A_1 > v \times A_2 \text{ (For same velocity of continuous wave)}$$

$$Q_1 > Q_2 \text{ (As Volumetric Flow rate [1], } Q=v \times A)$$

As both waves are in same sea water; the mass density is constant for these two continuous waves (Figure 1):

$$\rho \times Q_1 > \rho \times Q_2$$

$\rho \times Q_1$  and  $\rho \times Q_2$  are mass flow rate [2] for both waves.

$$m_1 > m_2 \tag{1}$$



Figure 1: Comparison between wider and narrower waves in North Sea.

$$\text{For curved surface area; } m = \iint_A v \rho \cdot dA$$

According to Continuum concept of a fluid [3], considering waves are continuous and thus, total mass of a wave would be in effect while considering a point of a wave.

For a surface area,  $A_3=A_4$ ; where  $A_3$  and  $A_4$  are infinitesimal surface area of consecutively rip wave and normal wave.

Pressure at a point of rip wave,

$$P_1 = F_1 / A_3$$

Pressure at a point of another wave,

$$P_2 = F_2 / A_4 = F_2 / A_3$$

From (1);  $m_1 > m_2$

$m_1 \times a > m_2 \times a$  [It was presumed at start of theory that both waves progress with same acceleration  $a$ ]

$$(m_1 \times a) / A_3 > (m_2 \times a) / A_3$$

$$F_1 / A_3 > F_2 / A_3 \text{ (As Force=mass} \times \text{acceleration)}$$

$$F_1 / A_3 > F_2 / A_4$$

$$P_1 > P_2$$

Thus, pressure on a rip current is higher than pressure on normal wave. If  $P_3 = \frac{1}{2} \rho v^2 + P_{\text{static}}$  and  $P_4$  are stagnation pressure [4] for rip and normal wave.

Thus, stagnation pressures are given by:

$$P_3 > P_4$$

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It can be inferred ocean waves with increased continuous surface area can provide higher resistance to a point particle trying to pass through it. Now, assuming electromagnetic waves with high frequency (infinitesimal wavelength between each phase) such as  $\gamma_{\text{hard}}$ ; subjected to infinitesimal wavelength  $\lambda$  and amplitude  $A$ . Now, if the surface area that  $\gamma_{\text{hard}}$  resultant ray covers, the resultant amplitude and connecting length were to increase; each point of  $\gamma_{\text{hard}}$  would have higher stagnation pressure.

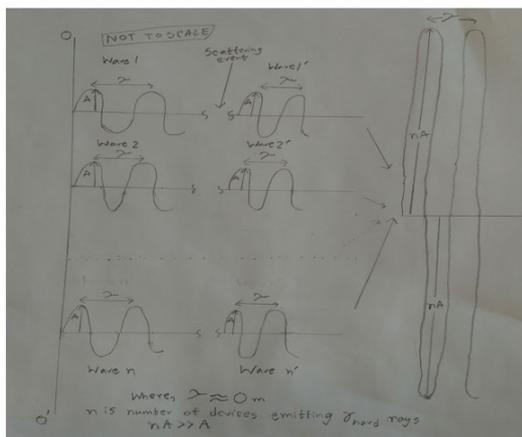


Figure 2: Constructive interference engineering to create high amplitude of wave.

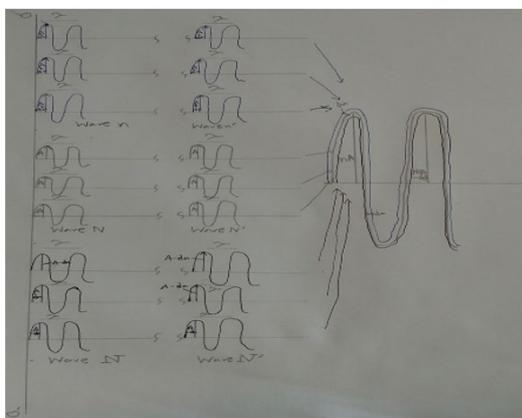


Figure 3: Increasing effective surface area.

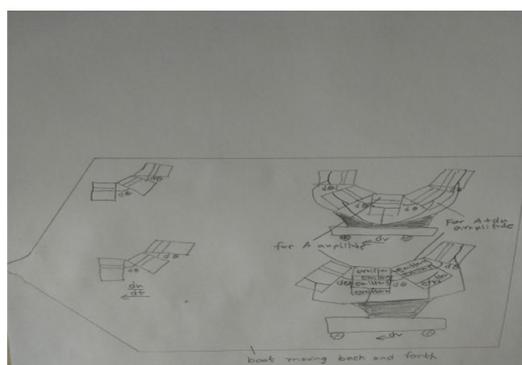


Figure 4: Application proposal.

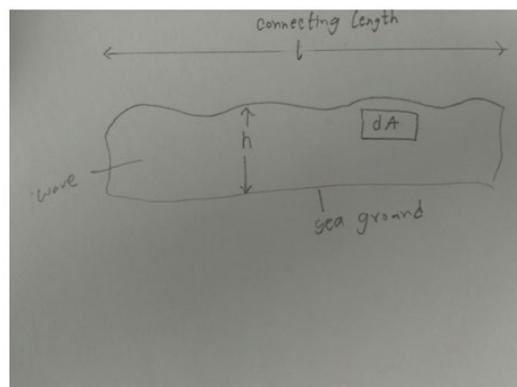


Figure 5: Connecting length.

For increasing amplitude; (n-1) constructive interference [5] can be used. Where, n represents number of waves and  $n \gg 1$  such as the following Figure 2:

Now, considering infinitesimal amplitude increase  $dx$  such that

$$A + dx \approx A, A + 2dx \approx \dots A + Ndx \approx A + (N - 1)dx$$

and similarly, in opposite surface;

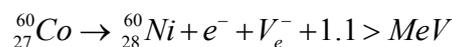
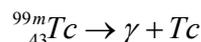
$A - dx \approx A, A - 2dx \approx \dots A - Ndx \approx A - (N - 1)dx$  amplitude of  $\gamma_{\text{hard}}$  rays are emitted with same wavelength  $\lambda$  in such a way that they do not interfere; however, their resultants are so close consecutively that all resultants are in effect; act as if a single, much higher surface area-resultant (Figure 3).

## Discussion

Now let us consider we are able to move such wave with velocity; it is theorized that such high surface area, increased amplitude and increased connecting wave length with velocity  $v$  will have higher stagnation pressure at each existing point of wave for a matter with length  $> dx$  to pass through than a wave with lower surface area or naturally occurring  $\gamma$  wave. Thus, such wave in motion; because of its high stagnation pressure; spanning at its' surface in effect, can make a medium such as air impermeable for aero planes or jets from passing through. If the aerial vehicles' building materials aren't strong enough against exerted stagnation pressure, the point of aerial vehicle in contact with the effective surface area of wave will not pass through and the vehicle will be cut into pieces mid-air.

## Application proposal for exerting high pressure on aerial vehicles attempting to pass through

To increase amplitude, let us consider n emitters in velocity  $v$  of gamma rays positioned as such that they emit gamma rays for increasing amplitude of resultant as shown in Figure 4. Inside the emitters:



Now let us consider a separate set of emitters, also having horizontal velocity  $v$ , but within angular distance  $d_0$  such that the emitted  $\gamma_{\text{hard}}$  rays; are at  $dx$  distance with previous set of  $\gamma_{\text{hard}}$  rays. If we consider a third set of  $\gamma_{\text{hard}}$  rays which have  $d_0$  angular distance with second set and  $2d_0$  angular distance with first set of  $\gamma_{\text{hard}}$  rays in such a way so that the emitted  $\gamma_{\text{hard}}$  rays from third set has  $dx$  distance with second set and  $2dx$

distance with first set of  $\gamma_{\text{hard}}$  rays. If we continue this sequence of N set of emitters; with  $(N-1) d_{\gamma}$  angular distance with previous emitter; we will keep on amplifying the final amplitude as well surface area of the total resultant wave where amplitude for each set will be  $nA$  and effective surface area of a phase will depend on how many sets of emitters we are considering.

### Surface area in effect

Though having  $dx$  gap between some particles, the surface area in effect means the surface area which doesn't let objects with higher length than gap to pass through, as such acting almost as a surface area.

### Conclusion

The higher the amplitude of the wave the further up in the sky the gamma ray will cover. With increased surface area in effect, the more

area the electromagnetic wave will span. With number of emitters being a very high amount; it is expected that the electromagnetic wave will have a longer connecting length and thus will exert higher stagnation pressure against objects as number of emitters are increased and at a point breaking anything that tries to pass through it.

### References

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